
Application No.: 10/637,092

Docket No.: 1315-045

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. *(Currently amended)* A friction stir welding apparatus of a piston for a swash plate type compressor with variable capacity, the friction stir welding apparatus comprising:

~~[[the]]~~ first and second supporting parts ~~(31a and 31b)~~ mounted on the top surface of a table~~[(36)]~~, the first and second supporting parts rotatably supporting ~~[[the]] a~~ first piston member~~[(23)]~~ and ~~[[the]] a~~ second piston member~~[(26)]~~, the first piston member having a bridge~~[(21)]~~ and a first coupling part~~[(22)]~~ protruding from the bridge~~[(21)]~~, the second piston member having a second coupling part~~[(24)]~~ coupled with the first coupling part~~[(22)]~~ of the first piston member~~[(23)]~~ and a hollow part~~(25) formed by being coupled with the first piston member[(23)]~~;

~~a welder welding means(40) rotatably inserted insertable~~ into welding portions of the first and second piston members~~(23 and 26)~~ supported by the first and second supporting parts~~(31a and 31b)~~, ~~the welder being arranged~~ for carrying out friction stir welding along the rotation direction of the first and second piston members~~(23 and 26)~~;

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support rollers~~[(33)]~~ elastically mounted on the lower side of the first and second piston members~~(23 and 26)~~ to arrange for causing central axis lines of the first and second piston members~~(23 and 26)~~ to be on central axis lines of the first and second supporting parts~~(31a and 31b)~~ when while the first and second piston members~~(23 and 26)~~ are supported on the first and second supporting parts ~~(31a and 31b)~~, the support rollers~~(33)~~ vertically moving being arranged for vertical movement within a predetermined height~~[(H)]~~ range while supporting the first and second piston members~~(23 and 26)~~; and

a structure transferring means~~(38)~~ for transferring the welder welding means~~(40)~~ from the welded portions to a bridge portion of the first piston member predetermined position after the friction stir welding of the welding portions by means of the welder welding means.

2. *(Currently amended)* The friction stir welding apparatus according to claim 1, wherein further including a guide member~~[(60)]~~ for controlling the position of the central axis lines, the guide member being ~~[(is)]~~ detachably mounted on the upper portion of the second supporting part~~[(31b)]~~, and the guide member~~[(60)]~~ being arranged to exactly position~~[(s)]~~ the central axis line of the second piston member~~[(26)]~~ onto the central axis line of the second supporting part~~[(31b)]~~ while ~~[[pressurizing]] applying pressure to~~ the upper surface of the second piston member~~[(26)]~~ temporarily coupled to the first piston member~~(23)~~, so that for causing the central axis line of the first piston member~~[(23)]~~ to be elastically lifted or lowered by the support rollers~~(33)~~ ~~is coincided and coincide~~ with the central axis line of the first supporting part~~[(31a)]~~.

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3. (Currently amended) The friction stir welding apparatus according to claim 1, wherein the transferring means (38) has A friction stir welding apparatus of a piston for a swash plate type compressor with variable capacity, the friction stir welding apparatus comprising:

first and second supporting parts mounted on the top surface of a table, the first and second supporting parts rotatably supporting a first piston member and a second piston member, the first piston member having a bridge and a first coupling part protruding from the bridge, the second piston member having a second coupling part coupled with the first coupling part of the first piston member and a hollow part coupled with the first piston member;

a welder rotatably insertable into welding portions of the first and second piston members supported by the first and second supporting parts, the welder being arranged for carrying out friction stir welding along the rotation direction of the first and second piston members;

support rollers elastically mounted on the lower side of the first and second piston members for causing central axis lines of the first and second piston members to be on central axis lines of the first and second supporting parts while the first and second piston members are supported on the first and second supporting parts, the support rollers being arranged for vertical movement within a predetermined height range while supporting the first and second piston members; and

a structure for transferring the welder from the welded portions to a predetermined position, the structure including a servo-motor[(37)] for transferring the table(36) through a predetermined distance in an axial direction of the piston.

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4. *(Currently amended)* The friction stir welding apparatus according to claim 1, wherein at least two of the support rollers [[33]] are rotatably mounted adjacently with adjacent to each other on a plurality of supporting member(34) members, which are mounted [[on]] an the upper portion of a [[fixed]] stand[[(35)]] fixed [[on]] to the upper surface of the table(36).

5. *(Currently amended)* The friction stir welding apparatus according to claim 4, wherein A friction stir welding apparatus of a piston for a swash plate type compressor with variable capacity, the friction stir welding apparatus comprising:

first and second supporting parts mounted on the top surface of a table, the first and second supporting parts rotatably supporting a first piston member and a second piston member, the first piston member having a bridge and a first coupling part protruding from the bridge, the second piston member having a second coupling part coupled with the first coupling part of the first piston member and a hollow part coupled with the first piston member;

a welder rotatably insertable into welding portions of the first and second piston members supported by the first and second supporting parts, the welder being arranged for carrying out friction stir welding along the rotation direction of the first and second piston members;

support rollers elastically mounted on the lower side of the first and second piston members for causing central axis lines of the first and second piston members to be on central axis lines of the first and second supporting parts while the first and second piston members are supported on the first and second supporting parts, the

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support rollers being arranged for vertical movement within a predetermined height range while supporting the first and second piston members; and

a structure for transferring the welder from the welded portions to a predetermined position, at least two of the support rollers being rotatably mounted adjacent to each other on a plurality of supporting members, which are mounted on the upper portion of a stand fixed to the upper surface of the table the fixed stand(35) includes including a vertical through-hole[[((51))], and [[a]] an ascent and descent member[[((53))]] connected with the lower surface of the supporting member[[((34))]] inside the vertical through-hole[[((51))]], the ascent and descent member[[((53))]] being elastically supported by an elastic spring[[((52))]].

6. *(Currently amended)* The friction stir welding apparatus according to claim 5, wherein the ascent and descent member[[((53))]] has [[the]] a lower portion protruding to the outside of a narrower path than the vertical through-hole[[((51))]], and the protruding end of the ascent and descent member[[((53))]] is inclined at a predetermined slant angle.

7. *(Currently amended)* The friction stir welding apparatus according to claim 5, wherein a fixing means(70) stabilizer is mounted under the ascent and descent member[[((53))]], the fixing means(70) stabilizer being arranged for fixing the supporting member[[((34))]] by stopping the movement of the ascent and descent member(53) when in response to the first and second piston members(23 and 26) are being supported on the [[the]] first and second supporting parts rotation(31a and 31b).

8. *(Currently amended)* The friction stir welding apparatus according to claim 6, wherein a fixing means(70) stabilizer is mounted under the ascent and descent

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member~~[(53)]~~, the ~~fixing means~~⁽⁷⁰⁾ stabilizer being arranged for fixing the supporting member~~[(34)]~~ by stopping the movement of the ascent and descent member~~(53)~~ when in response to the first and second piston members~~(23 and 26)~~ are being supported on the ~~[(the)]~~ first and second supporting parts rotation~~(31a and 31b)~~.

9. *(Currently amended)* The friction stir welding apparatus according to claim 7, wherein the ~~fixing means~~⁽⁷⁰⁾ stabilizer includes: a wedge type fixing member~~[(74)]~~ having ~~[(the)]~~ a front end inclined like the end of the ascent and descent member~~[(53)]~~, a horizontal through-hole~~[(71)]~~ formed therein, and a movable rod~~[(73)]~~ elastically supported by ~~[(the)]~~ an elastic spring~~[(72)]~~ inside the horizontal through-hole~~[(71)]~~; and a connection member~~[(76)]~~ connected to an end of the movable rod~~[(73)]~~ protruding to the outside of the horizontal through-hole~~[(71)]~~ of the wedge type fixing member~~[(74)]~~.

10. The friction stir welding apparatus according to claim 8, wherein the ~~fixing means~~⁽⁷⁰⁾ stabilizer includes: a wedge type fixing member~~[(74)]~~ having ~~[(the)]~~ a front end inclined like the end of the ascent and descent member~~[(53)]~~, a horizontal through-hole~~[(71)]~~ formed therein, and a movable rod~~[(73)]~~ elastically supported by ~~[(the)]~~ an elastic spring~~[(72)]~~ inside the horizontal through-hole~~[(71)]~~; and a connection member~~[(76)]~~ connected to an end of the movable rod~~[(73)]~~ protruding to the outside of the horizontal through-hole~~[(71)]~~ of the wedge type fixing member~~[(74)]~~.

11. *(Currently amended)* The friction stir welding apparatus according to claim 9, [[wherein]] further including an air cylinder~~(77)~~ is connected to an end of the connection member~~(76)~~ and moves for moving the connection member~~[(76)]~~ back and forth, so

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that for causing the wedge type fixing member(74) is to be advanced to or returned from the end side of the ascent and descent member~~[(53)]~~ by the connection member~~[(76)]~~.

12. (*Currently amended*) The friction stir welding apparatus according to claim 10, ~~[[wherein]]~~ further including an air cylinder(77) is connected to an end of the connection member~~(76)~~, and ~~moves for moving~~ the connection member~~[(76)]~~ back and forth, ~~so that~~ for causing the wedge type fixing member(74) is to be advanced to or returned from the end side of the ascent and descent member~~[(53)]~~ by the connection member~~[(76)]~~.

13. (*New*) The apparatus of claim 1 wherein the structure includes a servo-motor for transferring the table through a predetermined distance in an axial direction of the piston.

14. (*New*) The apparatus of claim 4 wherein the fixed stand includes a vertical through-hole, and an ascent and descent member connected with the lower surface of the supporting member inside the vertical through-hole, the ascent and descent member being elastically supported by an elastic spring.

15. (*New*) The friction stir welding apparatus according to claim 14, wherein the ascent and descent member has a lower portion protruding to the outside of a narrower path than the vertical through-hole, and the protruding end of the ascent and descent member is inclined at a predetermined slant angle.

16. (*New*) The friction stir welding apparatus according to claim 14, wherein a stabilizer is mounted under the ascent and descent member, the stabilizer being arranged for fixing the supporting member by stopping the movement of the ascent and

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descent member in response to the first and second piston members being supported on the first and second supporting parts rotation.

17. (New) The friction stir welding apparatus according to claim 14, wherein a stabilizer is mounted under the ascent and descent member, the stabilizer being arranged for fixing the supporting member by stopping the movement of the ascent and descent member in response to the first and second piston members being supported on the first and second supporting parts rotation.

18. (New) The friction stir welding apparatus according to claim 7, wherein the stabilizer includes: a wedge type fixing member having a front end inclined like the end of the ascent and descent member, a horizontal through-hole formed therein, and a movable rod elastically supported by an elastic spring inside the horizontal through-hole; and a connection member connected to an end of the movable rod protruding to the outside of the horizontal through-hole of the wedge type fixing member.

19. (New) The friction stir welding apparatus according to claim 14, further including an air cylinder connected to an end of the connection member for moving the connection member back and forth for causing the wedge type fixing member to be advanced to or returned from the end side of the ascent and descent member by the connection member.